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Corresponding Author:	Vasileios Minasidis iSea, Environmental Organisation for the Preservation of the Aquatic Ecostystems GREECE
Corresponding Author Secondary Information:	
Corresponding Author's Institution:	iSea, Environmental Organisation for the Preservation of the Aquatic Ecostystems
Corresponding Author's Secondary Institution:	
First Author:	Vasileios Minasidis
First Author Secondary Information:	
Order of Authors:	Vasileios Minasidis
	Nikolaos Doumpas
	Periklis Kleitou
	Roxani Naasan Aga Spryridopoulou
	Paschalis Papadamakis
	Ioannis Giovos
Order of Authors Secondary Information:	
Author Comments:	
Response to Reviewers:	Reviewer #1: Dear authors, the manuscript was improved and I suggest acceptance in its current form. All the best. Reviewer #2: Comment 1: The authors need to cite all the records of this species from the Mediterranean Sea, Red Sea, Arabian Sea and the Arabian Gulf area. In spite of the authors mentioned that they have included such distribution in the introduction section, I cannot see any addition of a new references being added to the introduction.

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Additional records of Tripletail *Lobotes surinamensis* (Bloch, 1790), from the eastern Mediterranean

Vasileios Minasidis[1*], Nikolaos Doumpas[1], Periklis Kleitou[1,2], Roxani Naasan Aga Spryridopoulou[1], Paschalis Papadamakis[3], Ioannis Giovos[1,2]

[1]*iSea, Environmental Organisation for the Preservation of the Aquatic Ecosystems, Ochi Av. 11, 55438 Agios Paulos, Thessaloniki, Greece*

[2]*Marine and Environmental Research (MER) Lab Ltd., 202 Amathountos Av., Marina Gardens, Block B, Offices #13-14, Parekklisia, 4533 Limassol, Cyprus*

[3]*Fisheries Research Institute, 64007 Nea Peramos, Kavala, Greece*

***Corresponding author:** vasilis.minasidis@isea.com.gr, +30 2313 090696

Abstract

In the Mediterranean Sea, *Lobotes surinamensis* (Bloch, 1790) is considered as a rare species, albeit an increasing number of individual-based sightings published in the literature. In this study, we present 32 additional records of this thermophilic species from the Greek and Cypriot waters; reinforcing the evidence that the species is becoming more common to the region. All of the records were collected as part of the citizen science project "Is it Alien to you? Share it!!!" by a participatory process involving fishers and taxonomic experts. This work highlights the important role of citizen science as a tool for public engagement and for monitoring species distribution in a changing environment, like the Mediterranean basin.

Keywords: Lobotidae, Eastern Mediterranean Sea, Citizen science, Monitoring, Rare species

Introduction

The Atlantic tripletail or tripletail, *Lobotes surinamensis* (Bloch, 1790), is a marine species found in tropical and subtropical waters of all oceans; in the western Atlantic from New England southward to Argentina (Carpenter 2003) and Falkland Islands (Carpenter and Robertson 2015), in the eastern Atlantic from the Straits of Gibraltar to the Gulf of Guinea and Madeira (Carpenter and Johnson 2016), in the Indo-Pacific from East Africa through all countries of Southeast Asia north to Taiwan Province of China and southern Japan, northern Australia to southern Queensland, New Guinea to New Britain, and south to Fiji, except eastern Pacific (Florida Museum of Natural History 2005). It is a demersal and thermophilic species (Riede 2004) that lives at depths from 0 to 70 meters (Fricke et al. 2011), usually shallower than 10 meters, and with preference to brackish waters (Myers 1999; Kuiter and Tonozuka 2001). The maximum length reported is 110 cm (Robins and Ray 1986), normally ranging between 40 and 80 cm (Bouhlel 1988). The color of the fish is green-grey, darker in the top and lighter in the belly, with yellowish shades all over the body (Heemstra 1986). Juveniles are mottled with yellowish, brownish and black blotches, while adults can show a more uniform color, dark brown, greyish or blackish. Its common name "tripletail" comes from the dorsal and anal fins, that are more flattened, looking like extra tails (Smith 1997). *L. surinamensis* is often found swimming near the surface alone or in very small schools of two to four individuals (Breder 1949).

The species exhibits a well-known plant-mimetic behavior; swimming side by side with floating objects as a survival strategy to attract unsuspicious prey, avoid predators, and probably benefit from drifting long distances (Breder 1949; Watson 1996; Massuti and Renores 1994).

Lobotes surinamensis distribution has been geographically expanded from the Atlantic Ocean into the Mediterranean Sea via the Strait of Gibraltar (Deidun et al. 2010). In the Mediterranean Sea, the species was first recorded in 1875 (Doderlein 1875). Since then, *L. surinamensis* individuals have been reported across the entire region (Palom 1991; Gücü and Bingel 1994; De Pirro et al. 1996; Riera et al. 1999; Hemida et al. 2003; Camilleri et al., 2005; Zava et al. 2007; Deidun et al., 2010; Dulčić and Dragičević 2011;Tiralongo et al., 2016; Tunçer and Önal 2016; Tiralongo et al. 2018; Azzurro et al., 2019; Elbaraasi et al., 2019; Licchelli and Denitto, 2020). In Greece, the first documented report of the species dates back in 1968 (Aegean Sea) (Bini 1968). Since then, few record have been reported from the Greek seas (Ondrias 1971; Roux in Whitehead et al. 1986; Fischer et al. 1987; Papaconstantinou 1988; Koutsogiannopoulos 2010), including the Aegean Sea (Economidis 1973; Economidis and Bauchot 1976) and sporadically other areas, such as Thermaikos Gulf (Minos and Economidis 2007) and Maliakos Gulf (Kavadas and Bekas 2014). In Cyprus, *L. surinamensis* was first sighted in 2008 (Coral Bay, Paphos) and subsequently reported from Limassol in 2015 (34°33'58.1"N, 33°01'05.1"E), and from Paphos, Peyia - Coral bay port (34°51'22.0"N, 32°21'41.6"E), in 2016 (Dulčić et al. 2014; Kleitou and Crocetta 2016).

In this work, we utilized citizen science and social media to collect observations of tripletail from the Greek and Cypriot marine waters (eastern Mediterranean) providing additional information on basic ecological information of the species. Citizen science is currently emerging globally, empowering scientists by providing massive and spatially broad data (Newman et al. 2012). The method is currently flourishing in the Mediterranean, highly supported by the increasing use of social media and other modern technologies like smartphones (Cardoso et al. 2017). Several projects exist that facilitate massive reporting of various marine taxa (Giovos et al. 2019 and references within; Tiralongo et al., 2019a; Bargnesi et al. 2020 and references within; Naasan Aga Spyridopoulou et al. 2020) and habitats (Gerovasileiou et al. 2016). Our data highlight the value of citizen science and social media for supporting marine research in the changing environment of the Mediterranean Sea.

Materials and Methods

In 2016, an online data repository was established by iSea, in which citizen scientists could easily upload photographic material along with information on specimen size (length and/or weight), depth, number of specimens, exact location, date, type of observation (freediving, underwater photography, shore-base fishing, boat-based fishing, spearfishing), substrate (seagrass, rocky substrate, soft substrate) and the adeptness of the reporter (recreational fisher, photographer, naturalist, etc). All pictures are checked for their authenticity and originality using the automatic image recognition tool of Google. All verified pictures are sent to a team of taxonomic experts that identifies the species to the lowest taxonomic level possible and validates the observations before a record is uploaded in the project's database (see Giovos et al. 2019).

A group on Facebook was established back in 2017 to facilitate citizen science. The project's Facebook group currently numbers more than 11,500 members, with about 5,000 actively engaged on a daily basis. The vast majority of the participants are recreational fishers, followed by scuba divers, naturalists and professional fishers (Giovos et al. 2019). Furthermore, the group community includes several experts on marine alien species offering their expertise for the identification of the reported specimens while at the same time influence and engaging public engagement with scientific issues.

Results and Discussion

In total, 27 observations of the species were collected in the context of this work between 2007-2019. Specifically, 9 observations were recorded from Cyprus and 18 from Greece (Table 1; Fig. 1). From those observations, 32 individuals were reported. The majority of the observers were recreational fishers (45.00%), followed by scientists (22.00%), free divers (11.00%) and others (e.g. beachgoers, journalists and news reporters) while most records were reported in 2018 (Table 1). About 19% of the records were found in brackish waters (number 4, 5, 16, 24, 25 in Table 1). Interestingly, several records were juvenile individuals exhibiting various coloration patterns.

The present work provides additional information for one uncommon species of fish in the Mediterranean Sea. To date, the citizen science project of iSea "Is it Alien to you? Share it !!!" has gathered a vast amount of information, including several records of alien and rare species from the eastern Mediterranean (Giovos

et al. 2019; Naasan Aga Spyridopoulou et al. 2020) and first records of alien and native species from the Mediterranean (e.g. Giovos et al. 2018; Langeneck et al. 2019; Giovos et al. 2020), Greece (e.g. Tiralongo et al. 2019b; Tsiamis and Giovos 2019) and Cyprus (e.g. Doumpas and Kleitou 2019; Kleitou et al. 2019).

Our data suggest that *L. surinamensis* might be more frequent than previously thought (Coll et al. 2010 estimated the mean probability of *L. surinamensis* occurrence 0.36, with 0.40 being the threshold for frequent species) at least in the waters of Greece and Cyprus. The species is thermophilic and originally was more abundant in the South and East Mediterranean (Akyol and Kara 2012; Bilge et al. 2016). Several native species in the Mediterranean are currently displaying a northward expansion like *Sparisoma cretense* (Linnaeus, 1758) (Kruschel et al. 2012) or *Alectis alexandrina* (Geoffroy Saint-Hilaire, 1817) (Naasan Aga Spyridopoulou et al. 2020) as a result of the increasing sea surface temperatures (Volosciuk et al. 2016; Pastor et al., 2018). It could be the case that the species is favored by the climate change as predicted for thermophilic species in general (Moullec et al. 2019; Dimitriadis et al. 2020). Interestingly, almost half of the observations (48.00%) were reported inside ports/harbors, while approximately 19% of records were observed close to estuaries and brackish waters, such as the Evros River, the Strymonas River and the Lissos River (Fig. 1; Table 1), indicating a preference of the species for protected, unexposed habitats . Furthermore, most of the records were found in shallow waters below 10 meters depth (Table 1). It is possible that the increasing number of the species records might be a result of the increasing number of citizen science projects in the Mediterranean and the use of social media (Giovos et al., 2019 and all references within).

The contribution of citizen science is becoming crucial in marine science nowadays. The proper communication with scientists is constantly producing new data that can be used to understand the presence and distribution of species in the Mediterranean Sea. Citizen science has the potential to address a big gap in marine research despite a margin of error that should be taken into account since reports are provided by non-scientists (Marshall and Pierce 2012; Katsanevakis and Moustakas 2018; Naasan Aga Spyridopoulou et al. 2020). In a shifting climate and a changing basin, the participation and contribution of citizen scientists in monitoring shifts in species distributions is critical (Giovos et al., 2019; Azzuro et al., 2019).

Scientists in the Mediterranean must continue monitoring the presence of the species to confirm or reject the hypothesis of its fast range expansion due to the increasing sea surface temperatures in the basin.

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Tables

Table 1. Records of *Lobotes surinamensis* in the eastern Mediterranean Sea with information on number of individuals (N), depth (m), area, coordinates (Latitude: Longitude), date (DD/MM/YYYY), type of observation (T.OB.) (spearfishing, S; boat fishing, BF; shore fishing, SF; shore photography, SP; recreational longlining, RL; swimming animal, SA; underwater photography, UP; hand gathering, HG; nets, N; land observation, LO) and links of the photographic evidence of each observation.

n	N Individuals	Depth	Area	Coordinates	Date	T.OB.	Links
1	1	10	Pirgadikia, Greece	40°20'04.0"N, 23°43'10.2"E	03/07/2007	S	Photo 1
2	1	N/A	Lesvos island, Greece	39°10'04.3"N, 26°09'43.4"E	01/07/2009	BF	Photo 2
3	1	N/A	Skopelos island, Greece	39°07'19.3"N, 23°43'44.7"E	08/07/2015	SP	Photo 3
4	1	0	Argolic Gulf, Greece	37°32'08.2"N, 22°55'07.4"E	27/04/2017	SF	Photo 4
5	1	45	Strimonikos Gulf, Greece	40°45'39.3"N, 23°49'42.5"E	03/09/2017	RL	Photo 5
6	1	N/A	Skopelos island, Greece	39°07'23.2"N, 23°43'48.0"E	In 2017	SA	-
7	1	N/A	Allonisos island, Greece	39°08'39.8"N, 23°51'55.5"E	In 2017	SA	-
8	1	N/A	Lakonikos Gulf, Greece	36°30'26.2"N, 23°03'28.4"E	In 2017	SF	-
9	1	0	Chrysochou Gulf, Cyprus	35°04'16.6"N, 32°20'07.1"E	13/10/2017	UP	Photo 9
10	1	0	Ormos Panagias, Greece	40°13'57.6"N, 23°44'17.9"E	In 2017	SP	Photo 10
11	1	0	Protaras, Cyprus	35°00'00.6"N, 34°04'06.5"E	24/09/2017	HG	Photo 11
12	1	7	Chrysochou Gulf, Cyprus	35°03'08.6"N, 32°22'27.9"E	24/10/2017	UP	Photo 12
13	1	0	Protaras, Cyprus	35°03'05.5"N, 34°01'26.3"E	27/09/2017	S	Photo 13
14	1	2	Evoikos Gulf, Greece	38°20'14.4"N, 23°54'50.4"E	23/05/2018	SF	Photo 14
15	1	N/A	Protaras, Cyprus	35°00'11.5"N, 34°03'50.9"E	12/03/2018	HG	Photo 15
16	1	N/A	Delta Evrou, Greece	40°48'25.3"N, 26°01'32.3"E	09/07/2018	N	Photo 16
17	1	0	Cape Greko, Cyprus	34°59'01.3"N, 34°04'11.9"E	29/08/2018	UP	-
18	2	N/A	Skopelos island, Greece	39°07'26.0"N, 23°43'49.9"E	09/09/2018	SA	Photo 18
19	2	0.1	Ierissos Gulf, Greece	40°22'57.1"N, 23°55'53.0"E	In 2018	SP	Photo 19
20	1	0	Protaras, Cyprus	35°00'00.6"N, 34°04'06.5"E	25/08/2018	HG	Photo 20
21	1	0	Ormidia, Cyprus	34°58'43.4"N, 33°46'04.4"E	30/01/2018	HG	Photo 21
22	1	5	Zygi, Cyprus	34°42'52.9"N, 33°18'25.4"E	04/08/2018	S	Photo 22
23	1	2	Thermaikos Gulf, Greece	40°34'43.0"N, 22°56'17.8"E	01/06/2018	LO	Photo 23
24	1	0.1	Kiparrisiakos Gulf, Greece	37°39'15.9"N, 21°19'30.9"E	01/08/2018	LO	Photo 24
25	1	N/A	Thracian Sea, Greece	40°56'27.5"N, 25°19'58.4"E	08/10/2019	SF	Photo 25
26	1	1	Kastelorizo island, Greece	36°09'01.0"N, 29°35'27.0"E	13/09/2019	SF	-
27	4	0.3	Rhodes island, Greece	35°55'40.3"N, 27°51'27.0"E	22/10/2019	SA	-

Figures

Fig. 1 Spatial distribution of the observations of the tripletail *Lobotes surinamensis* (Bloch, 1790) reported to the citizen-science project. Detailed information about each observation number is shown in Table 1

Fig. 2 Some of the reported specimens based on the photographic evidence provided by the citizen scientists to the project. Detailed information about each observation number is shown in Table 1

Conflict of Interest: The authors declare no conflict of interest.

Figure

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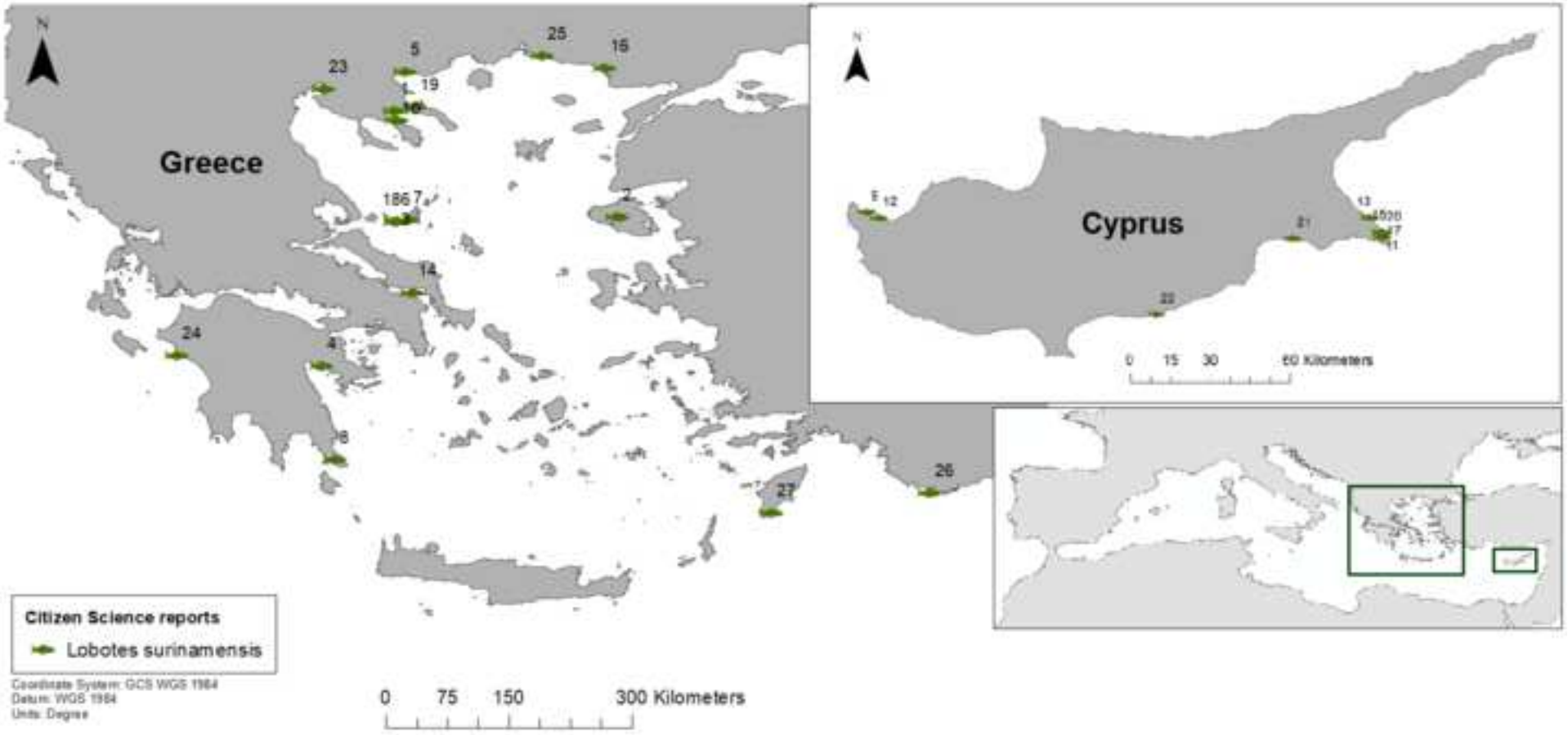

Figure

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